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SHARING THE VISION

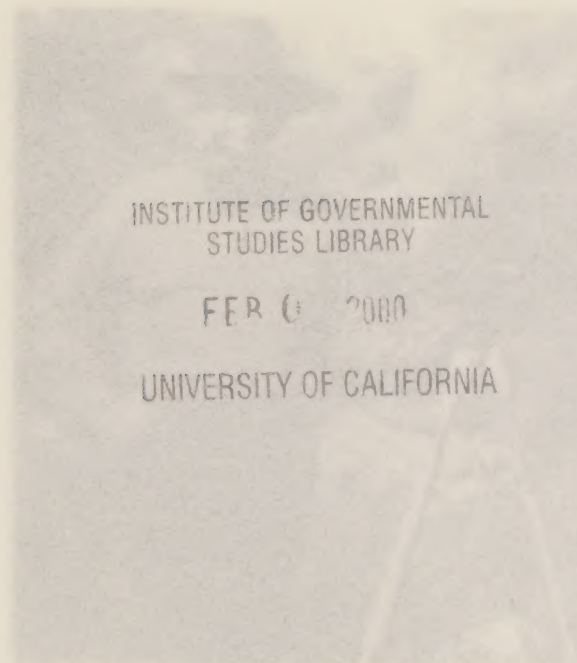
THE STORY OF THE LOS ANGELES AQUEDUCT



LOS ANGELES DEPARTMENT

OF WATER AND POWER

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Volume 100/1000

In 1913, the City of Los Angeles
completed construction of the first
Los Angeles Aqueduct.
It began as the dream of dedicated men
of vision and its completion was a monument
to perseverance, technology, and skill.
The Los Angeles Aqueduct stands today
as a reminder of what we are capable of
when we push forward boldly to meet
a challenging future.

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William Mulholland



Los Angeles was totally dependent on local water supplies at the turn of the century.

“THE CITY OWNS ITS WATER”

“It is not the economic theory of municipal ownership and administration of public utilities which concerns us; we are confronted with a condition and not a theory. The city owns its water, and our experience should convince us of...the farsighted wisdom of our Spanish and Mexican predecessors in holding on to the rights in the waters of Los Angeles with a grip of iron.”

*Board of Water Commissioners
First Annual Report, 1902*

In 1902, the City of Los Angeles purchased the Los Angeles City Water Company for \$2 million, protecting the City's lifeline in the face of tremendous growth. With a population of more than 100,000, the City had doubled more than four times in 30 years.

At the time though, the Board of Water Commissioners was unaware that it had also set in motion the means for Los Angeles' future greatness. As part of the purchase of the Los Angeles City Water Company, the Commissioners had become the employer of its superintendent, William Mulholland. The City would turn to Mulholland again and again to solve the problems created by a burgeoning population in a semi-arid region.

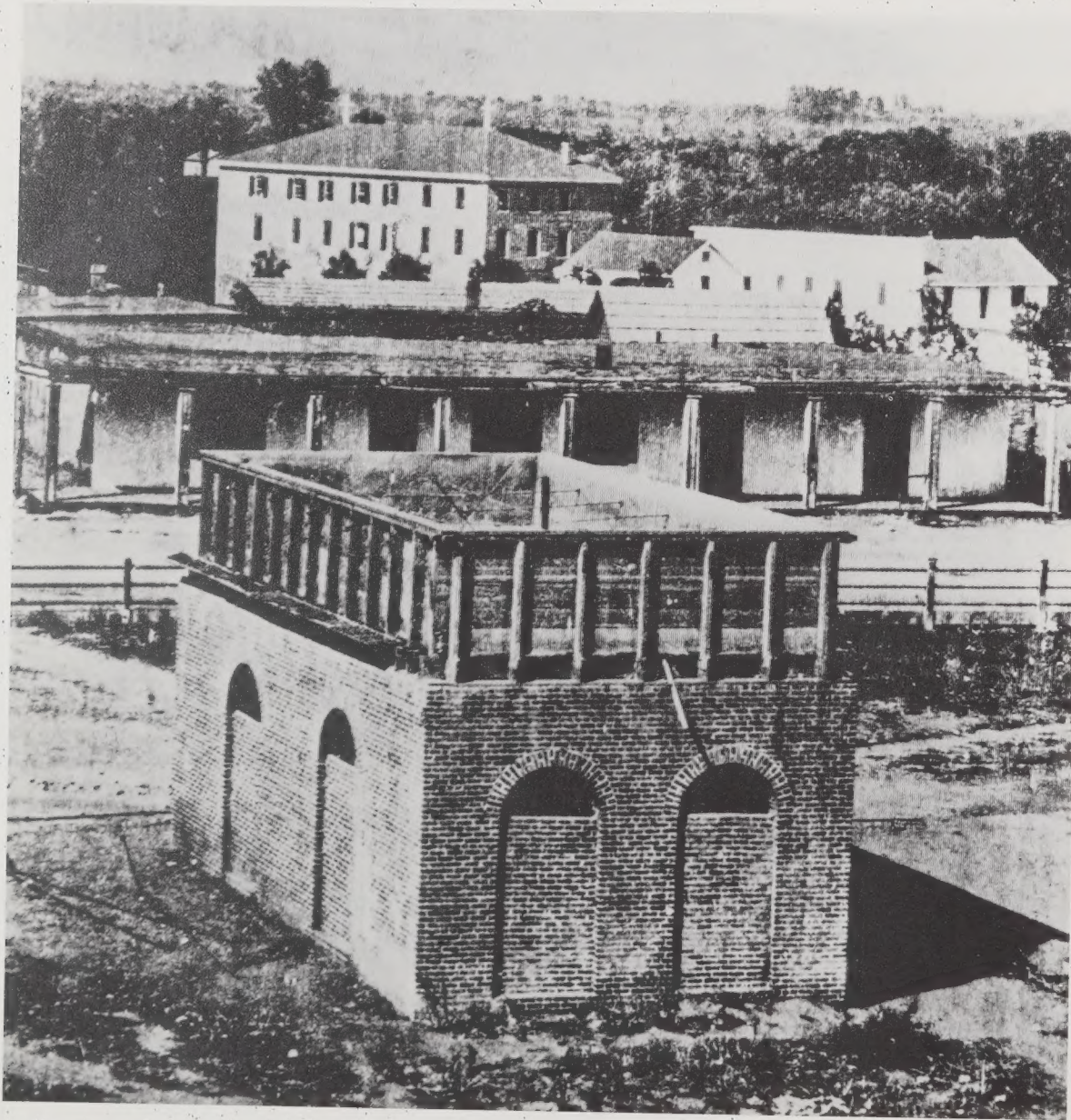
The preconditions for Los Angeles' greatness were there from the beginning. When Gaspar de Portola discovered and named the Rio Porciuncula on his mission of exploration from San Diego to Monterey in 1769, he recognized the site as ideal for settlement because of the ample water supply in the river.

The 11 families who founded El Pueblo de Nuestra Senora La Reina de Los Angeles constructed the city's first water

system, a brush “toma” or dam across the river. This dam diverted water to the Zanja Madre, or mother ditch, which fed irrigation canals in their adjacent fields.

The beauty of the Eastern Sierra Nevada.





The first reservoir in Los Angeles was built in 1860 in the Plaza by the privately owned Los Angeles Water Works Company.

Ownership of the water in the river was granted in perpetuity to the Pueblo at its founding by King Carlos III of Spain. When the City of Los Angeles incorporated 69 years later, the population of 1,610 was vested with all of the rights of the Pueblo, including these rights to the water of the Los Angeles River.

By 1854 this primitive water system was large enough to become a city department. The first person in charge was given the title “zanjero” or water overseer. One year later, William Mulholland, the man who would shape the future of Los Angeles through its water system, was born in Belfast, Ireland.

When Mulholland came to work for the Los Angeles City Water Company in 1878, the system had been leased to a private company. He was a ditch tender, a zanjero himself, though the system had progressed from ditches and hollowed logs to include a domestic service system with reservoirs and water mains. But the zanjias served the city for 35 more years, carrying water to water wheels which lifted the water for gravity flow to homes and fields.

At 31, William Mulholland became superintendent of the company. The system he oversaw included 300 miles of mains, six major reservoirs, infiltration galleries, and pumping plants. Three years later, in 1889, the company installed its first water meter at Mulholland's instigation.



William Mulholland, Superintendent.

Downtown Los Angeles, circa 1900.



A NEW SUPPLY

For 16 years Mulholland had watched the effect of Los Angeles' growth. The City, flourishing in a semi-desert environment, had already prompted initial concerns about conservation.

In the 1902 Annual Report he stated, "with a closely estimated population of 85,000...we reached the astounding consumption of over 26 million gallons per day, or about 306 gallons per capita...By the application of a few hundred meters the consumption was cut down nearly three million gallons per day."

Metering led to reduced consumption, but growth itself proved to be the pivotal issue. Mulholland began to feel the pressures of growth as head of the new Bureau of Water Works and Supply.

Mulholland's constant reflections on the City's needs were divided between conservation and additional supply. In 1902, he estimated that water metering could reduce per capita consumption to 150 gallons per day. By 1903, per capita consumption was actually reduced to 200 gallons per day from the previous high of 306. In the same period, however, Los Angeles had grown to a population of 175,000.

Mulholland's concerns about the inadequacy of Los Angeles' supply were realized during ten days in July 1904. For two years the Los Angeles River had been about 30% below normal. Water demands created by the City's breakneck growth overtook the river's supply and for those ten days the daily consumption exceeded inflow into the reservoirs by nearly four million gallons.

Mulholland began efforts to determine what the City's actual needs would be. He used a per capita demand of 150 gallons per day and estimated population growth based on the previous 10 years. He foresaw a city of 390,000 people using more than 58 million gallons per day by 1925.

The required volume was more than double the minimum flow of the Los Angeles River. Even the maximum recorded flow would fall ten percent short of meeting the City's needs. Only later would the superintendent learn that the actual growth of Los Angeles during the 20 year period would exceed his estimate by more than four times.

He began to search for a new supply. The local area yielded nothing. In his search for a new source, he surveyed all of the rivers and groundwater basins south of Tehachapi. He found groundwater limited and gradually being depleted by agriculture. Additional groundwater use would limit the development of the surrounding country, the source of wealth of the area.

Mulholland concluded Los Angeles would have to look elsewhere.



The Owens River Channel meanders through Owens Valley.

THE OWENS RIVER VALLEY

"The constant purpose of the government in connection with the Reclamation Service has been to use the water resources of the public lands for the ultimate greatest good of the greatest number."

*President Theodore Roosevelt
Annual Message to Congress, 1907*

Fred Eaton looked west to the sun setting behind the ragged escarpment of the Eastern Sierra Nevada. It was the summer of 1904. His friend, J.B. Lippincott had invited him, among other guests, on a family camping trip to the Sierras. They had begun in the Yosemite Valley. When they reached Tioga Pass, however, they had decided to descend to the other side of the mountains to the Mono Lake area. At Mono Lake, a smaller group had decided to go on to Bishop for supplies. Eaton and Lippincott were among them.

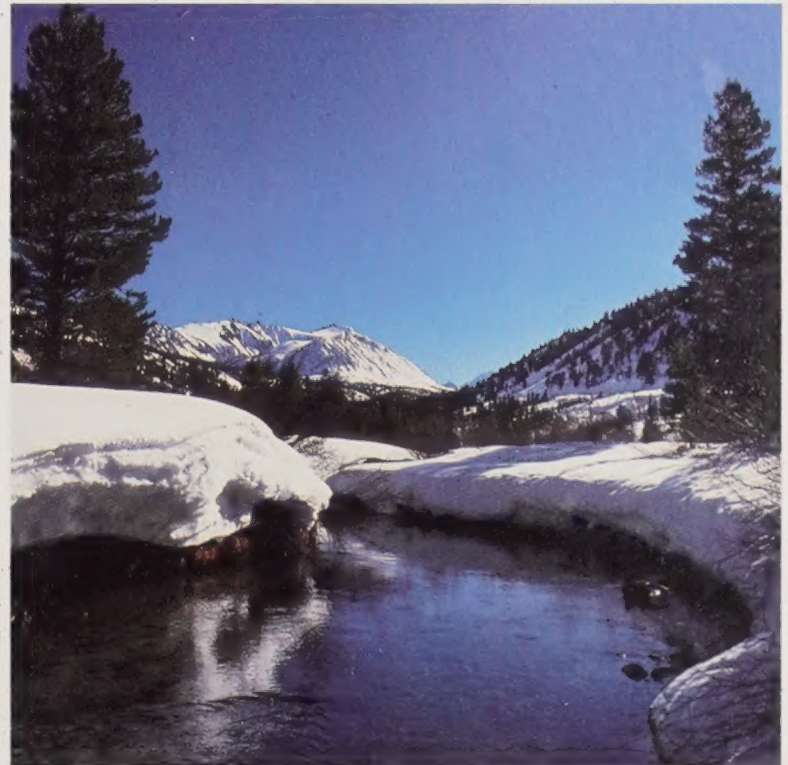
Eaton had first come to the valley twelve years earlier in 1892. He had ridden up on horseback to evaluate an irrigation project for a client. His engineer's eye took in the swollen streams of the Sierra snow melt, bursting their banks in their plunging descent onto the dry plain of the Owens Valley. He also noticed that the lower end of the valley had been blocked by a recent lava flow, but that previous to the eruptions the river had flowed in a channel straight south to the mountains just north of Los Angeles.

Owens Lake had become a basin from which there was no outlet. Once the water from the Sierras reached the lake it was useless, contaminated by the salt of the enclosed basin. Eaton

had begun to plan for this water rather than see it wasted, and now, in 1904 he was on the verge of acting on his plans.

Joseph Barlow Lippincott was also an engineer. The two men shared similar backgrounds and specialties. Eaton's public works experience had led him to become involved with

The spring snow melt along Rock Creek will become summer Owens River flow.





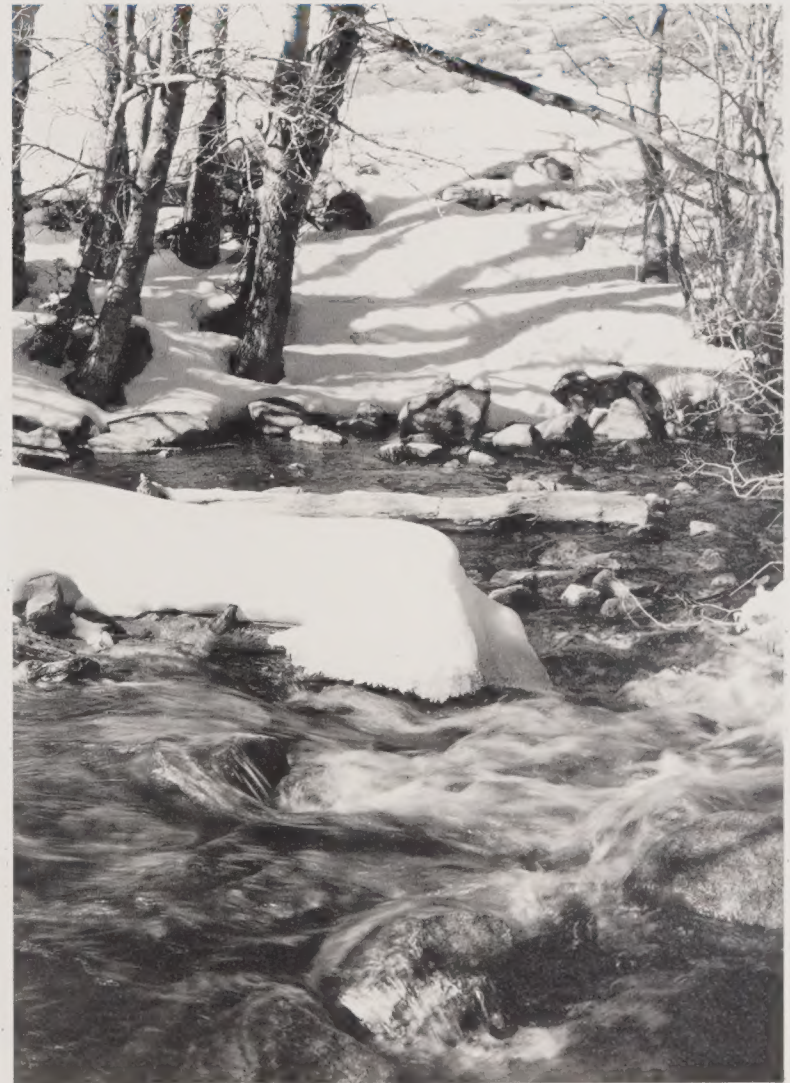
Just west of Lone Pine, Mt. Whitney (14,495') is the highest point in the Eastern Sierra.

irrigation projects while Lippincott's work as a topographer and hydrographer had led him to the Reclamation Service. Eaton's public service began with his election as City Engineer in 1886, while Lippincott had joined the United States Geological Survey in 1889. Both men were civic minded. Eaton had been mayor of Los Angeles in 1898 when the lease of the Los Angeles City Water Company had expired. He had promoted the purchase of the system by the City, and Lippincott had been a volunteer in the bond drive which had financed the purchase.

Lippincott's work as supervising engineer for California in the newly created U.S. Reclamation Service had brought him, independently of Eaton, to the Owens Valley. In the spring of 1903, his boss, Fredrick H. Newell, had suggested the Owens Valley as a site for a potential reclamation project. Lippincott had sent a surveyor to conduct a full study of the area so that the project's feasibility could be evaluated.

The members of the camping party who went to Bishop for supplies encountered many residents of the Owens Valley along the way. Traveling through the valley they discussed the area's potential for a reclamation project, including places of interest such as the reservoir site at Long Valley. To all observers, it was a group of friends on an outing, but Eaton's plans for the water would launch a long conflict.

Melting snow fills the Eastern Sierra streams.





J.B. Lippincott, Fred Eaton, and William Mulholland. This photograph appeared in the Los Angeles Times, August 6, 1906.

“THE OWENS VALLEY IS THE ONLY SOURCE”

Upon his return to Los Angeles, Eaton began to act quickly. Aware that Mulholland was searching for a new source of supply for Los Angeles, Eaton persuaded Mulholland to return to the valley with him.

Mulholland and Eaton also had much in common. Both started their careers with the Los Angeles City Water Company, they had both served as superintendent, and both had gone on to careers with the City.

Eaton was confident. He was sure the Owens River was the source Los Angeles needed for the future. Draining the eastern slope of the great mountains for more than 150 miles, the river followed a natural course south toward Los Angeles. Below the small lava flow at the southern end of the basin, Eaton pointed out the old river course, left over from the last ice age. Mulholland saw that the course of the old river was a direct route to the mountains north of Los Angeles and that these mountains were the last barrier to delivering a new supply to the thirsty city.

Mulholland began to plot an alignment, devising a system of aqueducts and reservoirs to transport the water entirely by gravity flow.

Eaton's proposal to Mulholland was a joint venture. Eaton would undertake to purchase the land and water rights and the City of Los Angeles would build the aqueduct. Once constructed, the aqueduct would supply the City with the water it required, but surplus water would also be exported from the valley. Eaton proposed that he export this water, paying the City a toll for its transportation, and selling it for irrigation purposes at the other end.

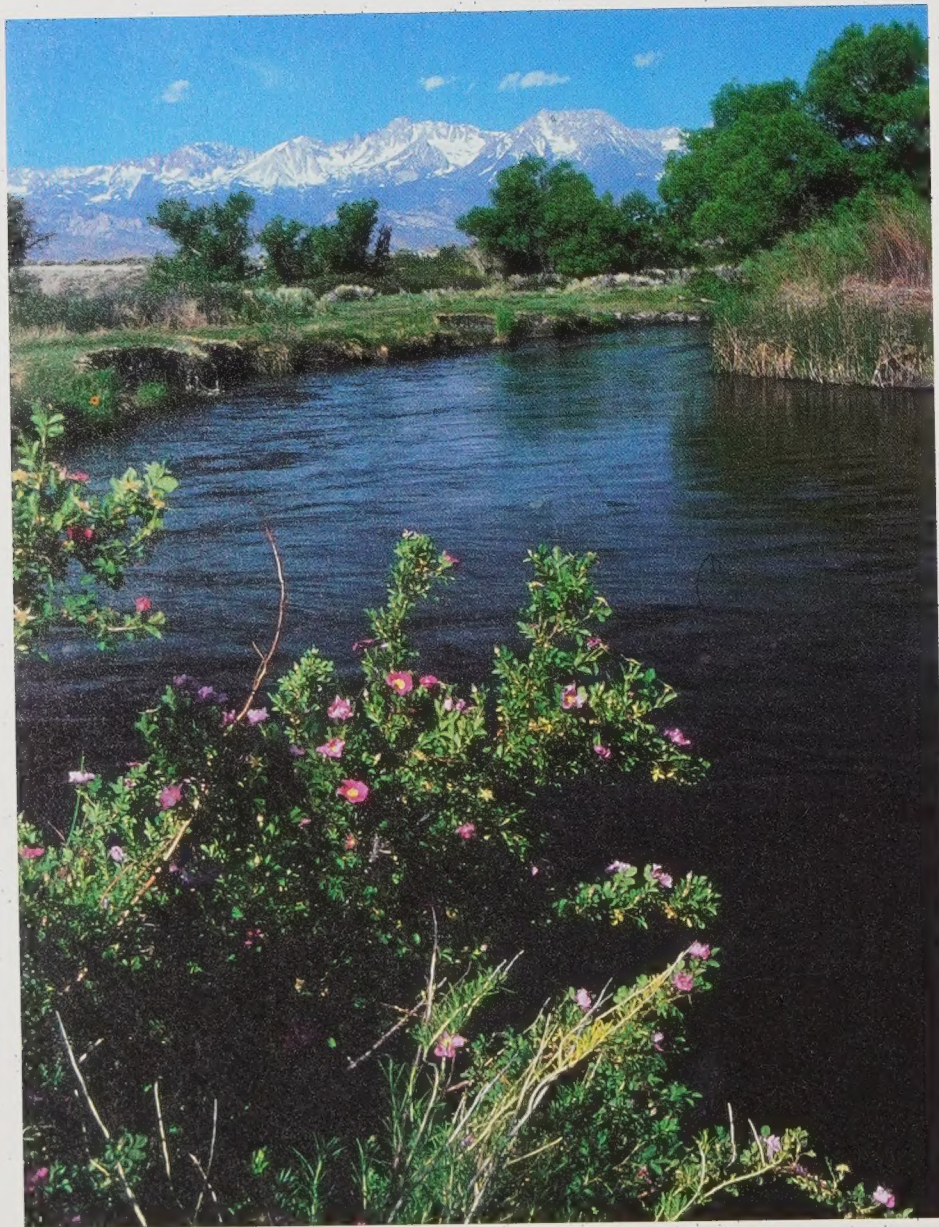
Mulholland agreed with Eaton, the project was viable. He strongly disagreed, however, about the joint venture.

Mulholland, like Eaton, knew that the U.S. Reclamation Service was evaluating the potential for a reclamation project in the Owens Valley. Mulholland realized that lands withdrawn from settlement for this purpose by the federal government could never be used for a venture that was not 100% public.

Eaton remained unconvinced. In the 1800s and early 1900s, the American entrepreneur was a hero. Men of great vision pursued great ventures, transcontinental railways, canals, and steamship lines among them. Eaton clung to his ambitions for the project, but by November, 1904 Mulholland had convinced him that there could be no joint venture.

Mulholland contacted Lippincott. He requested that Lippincott provide him with a copy of the Reclamation Service report so that he could evaluate stream flows and the potential of the Owens River as a source of water.

Lippincott deferred to Newell in this matter. Newell gave the report to Mulholland as a courtesy, but it only served to confirm Mulholland's conviction that the Owens River was the only viable option for Los Angeles.



The Owens River.



THE LAST SPIKE IS DRIVEN...

"The last spike is driven...the options are secured."

William Mulholland
July 29, 1905

In March 1905, Fred Eaton went to the Owens Valley to buy land options and water rights.

The major acquisition of this trip was the Long Valley Reservoir site. Eaton paid \$450,000 for a two month option on ranch lands and 4,000 head of cattle. All in all, he acquired the rights to more than 50 miles of riparian land, basically all parcels of any importance not controlled by the Reclamation Service.

On March 22nd, Mulholland reported to the Board of Water Commissioners. He had surveyed all the water sources available in Southern California and he recommended the Owens River as the only viable source. Immediately following Mulholland's presentation, Fred Eaton made his proposal that the City acquire from him whatever water rights and options he had been able to secure to further the project.

While in the valley, Eaton had conducted some business for Lippincott as well. The bulk of Lippincott's staff had been diverted to the lower Colorado River. The flood waters of the Colorado River had broken through temporary irrigation barriers and had carved a new channel southeast to the Salton Sink.

Lippincott knew Eaton was headed to the Owens Valley. Several power applications were pending for projects on the Owens River. Lippincott required information about who the

owners were, the use to which the power would be put, and the potential of these projects to interfere with the Reclamation Service's activities. Lippincott asked Eaton to do this work.

This trip became the source of conflict between the Owens Valley and the City of Los Angeles.

Eaton visited the Independence Land Office to do Lippincott's research. There he met Stafford Wallace Austin, the Land Register. The impression Eaton left was that he was there to do work for the Reclamation Service, and his subsequent land acquisition activities were interpreted in that light.

Whether deliberate or not, this impression caused anger among residents of the area, most notably Austin, when they discovered that Eaton was not acting on behalf of the Reclamation Service. To the people of the Owens Valley, selling water rights and land for a desired federal project was far different from selling land to Eaton and water rights to the City of Los Angeles.

Austin embodied the people's feelings of betrayal and anger. They were afraid that the Reclamation Service intended to abandon them, serving the interests of the City of Los Angeles instead. Austin wrote to the Commissioner of the U.S. General Land Office and to President Theodore Roosevelt to protest.

Meanwhile a serious decision faced the Reclamation Service. It was required to make a recommendation to the Secretary of the Interior regarding the feasibility of a project in the Owens Valley.

The Board of Engineers who were to make that recom-





mendation met on July 27, 1905. From an engineering standpoint, the project was viable. One of the commissioners had previously met with Austin and made sure discussions about the project gave serious consideration to his protest. However, the economic feasibility of the project was in question. The Board saw Los Angeles' ownership of the Long Valley Reservoir site and 50 miles along the river as a great impediment to proceeding with a Reclamation Service project.

The Secretary of the Interior, the cabinet member responsible for the Reclamation Service, made no decision until much later.

Mulholland returned from a car trip to the Owens Valley not two days after the Board of Engineers had met. His statement, "The last spike is driven...the options are secure," was the City's verdict on the project.

It seemed irrelevant that the Reclamation Service had made no decision when on July 29, 1905 the Los Angeles Times headlines bannered "Titanic Project to Give City a River."



A HUNDRED OR A THOUSAND FOLD MORE IMPORTANT

Austin's protest to Theodore Roosevelt in August prompted the appointment of a special investigator to examine the role of the Reclamation Service, and specifically Lippincott.

The special investigator found fault with both Lippincott and the City. He blamed the City for "not at once present[ing] their claims to the Secretary of the Interior so that the situation might have been determined on its merits in the beginning." Lippincott's failure was his inability to recognize his primary obligation to the Reclamation Service. Lippincott's defense echoed the sentiments of his president, "I firmly believe that I have acted for the greatest benefit of the greatest number, and for the best building up of this section of the country."

Lippincott was absolved of any blame that he assisted Eaton in securing options, however, the investigator's evaluation of Lippincott's behavior ranged from "peculiarly unfortunate [the camping trip to the Sierras]" to "ill advised...improper... farcical [Eaton's research for Lippincott]."

Mulholland's preliminary estimate of the cost of the project, including water rights and land, was \$25 million. Upon his recommendation, the Board of Water Commissioners chose to undertake the project, using its own resources to purchase Fred Eaton's options.

In order to finance the project though, they needed community support. They began by enlisting the help of the community's leaders. Among the first people the Board took into their confidence were the President of the Chamber of Commerce, J.O. Koepfli, and Los Angeles Times publisher, Harrison Gray Otis. Through publicity generated both by the Times' editorial position and investigations conducted by the

Chamber of Commerce, the community rallied to support the initial bond issue to purchase land and begin preliminary construction.

The \$1.5 million bond issue was approved by more than 10 to 1.

The City hired a prestigious team of engineers to examine the feasibility of the project. Their report states, 'We find the project admirable in conception and outline and full of promise for the continued prosperity of Los Angeles.' The Board of Water Commissioners appointed William Mulholland, Chief Engineer, Bureau of the Los Angeles Aqueduct.

That same year, 1906, the final verdict on the Los Angeles aqueduct was rendered by the highest authority.

On May 13th, the City submitted an application for right of way across federal lands for the purpose of constructing the Aqueduct.

In June, California Senator Frank Flint proposed a bill to grant these rights of way. It easily passed the Senate but ran into trouble in the House of Representatives where Congressman Sylvester Smith of Inyo County had organized an opposition to the bill. His argument was that Los Angeles did not require the water now, but was seeking to acquire it for future needs.

The City planned to include power plants in the project. These power plants would require a constant flow of water. This water would be transmitted by the City but was not required for domestic use. The City's plan was to sell the water for irrigation.

Smith argued that irrigation in Southern California should not take place at the expense of irrigation in the Owens Valley.



The Los Angeles Aqueduct now has 24 miles of unlined channel.



While Smith negotiated a “no irrigation” compromise, Flint went directly to a higher authority.

His appeal to Theodore Roosevelt met with a sympathetic hearing. Roosevelt, on June 25th, called a meeting of Flint, Secretary of the Interior Ethan A. Hitchcock, Bureau of Forests Commissioner Gifford Pinchot, and Director of the Geological Survey Charles D. Walcott. At the end of that meeting Roosevelt dictated the letter which would end the debate, “...yet it is a hundred or a thousand fold more important to the state and more valuable to the people as a whole if used by the city than if used by the people of the Owens Valley.”

On June 30, 1906 Los Angeles had the law which would permit the dream to become a reality.

In 1907, the voters of Los Angeles again gave their overwhelming endorsement to this project, approving a \$23 million bond issue for aqueduct construction. The only task which remained was to build it.



Pine Canyon Siphon, looking north. Pipe was hauled by mule along temporary tracks.

CONSTRUCTION BEGINS

The word spread that there were heavy construction jobs near Los Angeles. An itinerant army of "bundle stiffs", named for the bundles of bedding they carried on their backs, descended on the Mojave and spread out to the work camps up the line. It was fall, 1908.

Drawn by the promise of a long, good paying job, they were a tough, hard-drinking mix of nationalities: Greeks, Bulgarians, Serbs, Montenegrans, Swiss, and Mexicans. They worked hard, many of them saving their wages against their eventual return to their homelands. In one situation, the loyalty of these men to their homelands actually caused a labor shortage in the 1912 aqueduct work force. When war began to seem imminent in the Balkan states, some 1500 Serbs, Bulgarians, and Montenegrans left Mulholland's ditch and their \$2.25 per day jobs to return home to fight.

The work was hard and the conditions were rugged, but the men were provided with shelter, food, and medical care. In an era before compensation benefits were a condition of employment, the Bureau of the Los Angeles Aqueduct instituted a medical care plan for its workers at a fee of one dollar per month for those making \$40 per month and fifty cents for those making less.

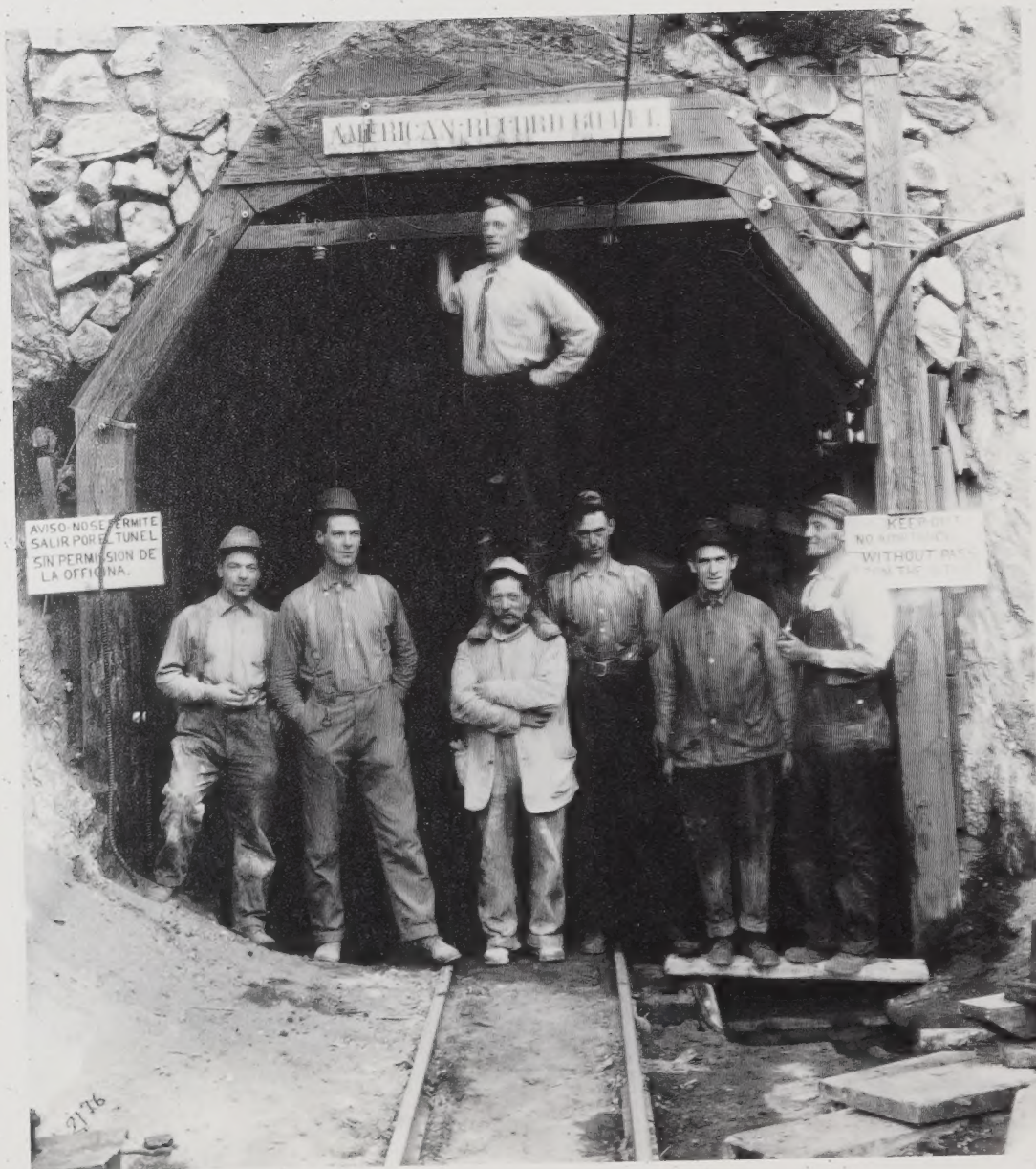
Benefits included "Medical, Hospital and Surgical service when needed, except for venereal disease, intemperance, vicious habits, injuries received in fights, or chronic diseases acquired before employment."

Dr. Raymond C. Taylor, the aqueduct's medical director, described life on the line. "In the winter, it was just as windy and bitter cold as it was hot in the summer. However, we had

practically no heat prostration, although I think I have seen in places in some of the big ditches in the lower Owens Valley that were 15 feet deep and 30 feet across the top, where the temperature in the bottom of the ditch must have been close to 130 degrees."

Accident and death figures for the project differ slightly from one account to another. However, the most authoritative summary appears in the "Complete Report" of 1916. The total number of accidents resulting in death were 43, in permanent injury, one, and miscellaneous accidents of a trivial nature, 1,282.

When Dr. Taylor met his counterpart for the New York Aqueduct, under construction at the same time, the two compared notes. Taylor said he lost about ten men per year to fatalities. The New York doctor said he lost one man per week.



Pipe was hauled along track into position for the construction of siphons.

Portal of the Elizabeth Tunnel. Here the crew set the record for hard rock tunnel driving, 604 feet in one month.



Visiting the Los Angeles Aqueduct by car. J.B. Lippincott is second from right.



The south end of Jawbone Siphon, an 8,095 foot steel pressure siphon.



The record breaking Elizabeth Tunnel crew at the south portal of the Elizabeth Tunnel.



WORLD RECORDS

Mulholland believed that the aqueduct's completion would be controlled by the driving of the longest tunnel. He scheduled the work so that the portals of the five mile long Elizabeth Tunnel were opened simultaneously with the beginning of the massive preparations for the rest of the construction.

The "Complete Report" gives this description: "Included in this work were 215 miles of road, 230 miles of pipe line, 218 miles of power transmission line and 377 miles of telegraph and telephone line. Fifty-seven camps were established along the line of work, most of them in the mountains, and good roads made to reach them." Sleeping tents and bunks were furnished to the laborers who numbered, at their peak, 3900.

There was no railroad to the Owens Valley from the south, although there was a narrow gauge track from Nevada at the north end. The construction superintendents considered hauling materials by wagon, but road construction costs and maintenance of mule teams was too expensive.

City officials approached several rail companies to provide service from Mojave to the Owens Valley. City engineers justified construction costs by estimating freight of 14 million tons and the Southern Pacific Railroad constructed the line north of Mojave. The new branch of the railroad constructed by Southern Pacific was known as the Nevada and California Railway. The route extended north from Mojave to a junction with the narrow gauge line near Lone Pine.

Cuddleback Ranch, five miles east of Tehachapi, was also on the main line of the Southern Pacific. There the city found the materials for making 1000 barrels of Portland cement a day.

They purchased 4,300 acres of land covering limestone quarries, clay deposits, and deposits of tufa also used for making concrete. In addition to the cement produced at the Monolith Mill built at Cuddleback Ranch, the City also used 200,000 barrels of cement bought from other sources.

An intimidating array of formidable construction challenges faced the engineers and work crews.

They blasted and drilled 142 tunnels totaling more than 43 miles in length. They built 34 miles of open unlined channel, 39 miles of concrete lined channel, and 98 miles of covered conduit which was cast in place. Some of the conduit was large enough to drive a car through.

Concrete was the most prevalent construction material for the Aqueduct, although in some cases the engineers might have preferred steel pipe. The use of steel pipe was limited by its tremendous cost, a result of having to transport it to California from its place of manufacture on the east coast by way of Cape Horn.

The construction of 12 miles of steel siphon in the Aqueduct provided some of the greatest challenges. In a canyon 120 miles north of Los Angeles, the aqueduct's engineers designed their most imposing work, an 8,095 foot steel pressure siphon across desolate Jawbone Canyon. The siphon varies from 7.5 feet to 10 feet in diameter and drops the water 850 feet to the canyon floor before its journey up the southern canyon wall. The heaviest steel plate of the siphon pipe is more than an inch thick and the entire siphon weighs more than 3,216 tons.

The longest siphon in the project is the pipe crossing



A fifty-two mule team hauls steel pipe into position for siphon construction.

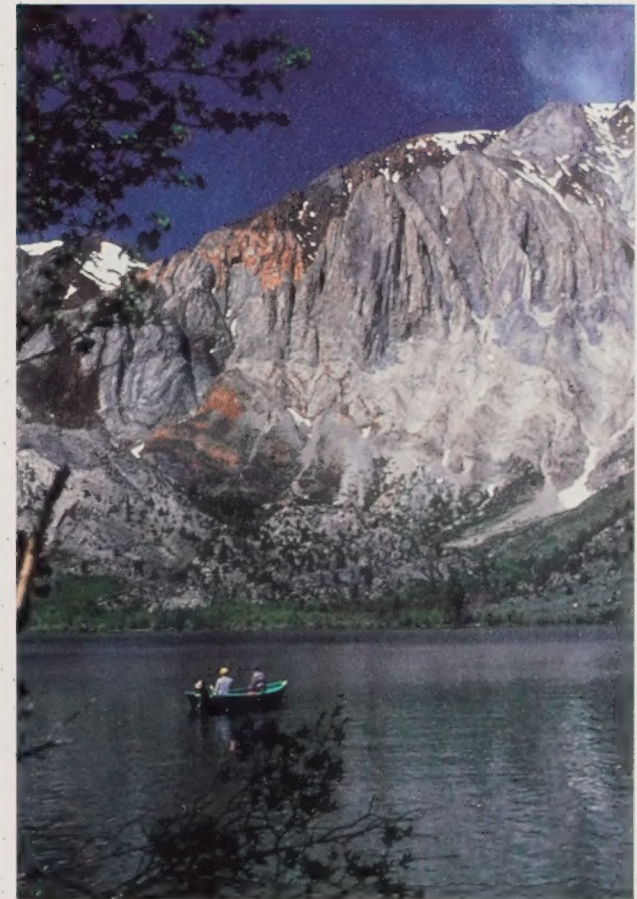
Antelope Valley. It is 21,800 feet in length, 15,600 of which are steel.

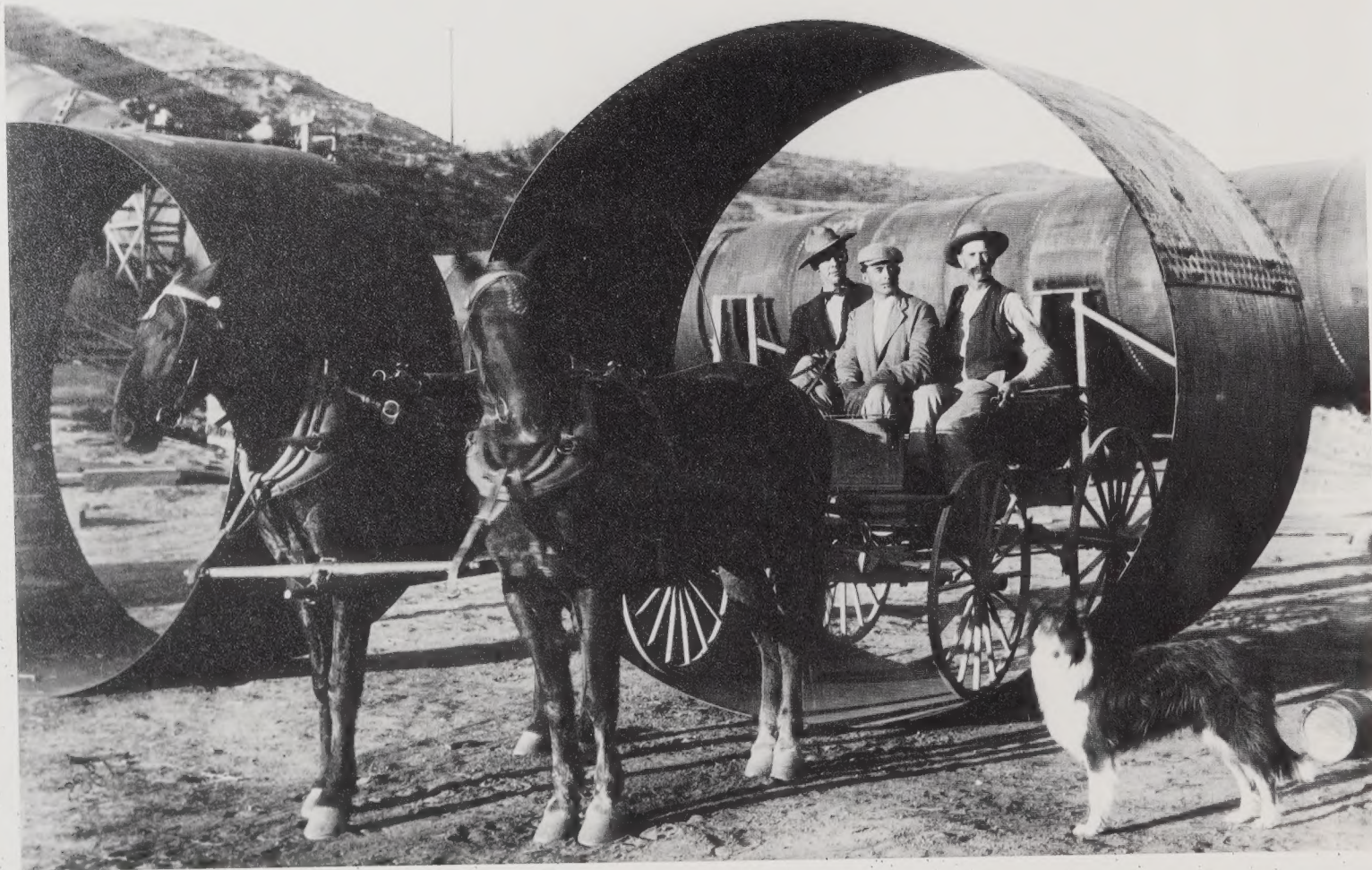
Of the three large reservoirs constructed: Haiwee, Fairmont, and San Fernando, Haiwee was the largest. It had a capacity of 63,800 acre feet, or enough to run the original aqueduct at full capacity for 80 days.

The most difficult and time consuming facilities were the tunnels. In the first 11 months of work, 22 miles of tunnel were driven. The Elizabeth Tunnel set the record for hard rock tunnel driving, 604 feet in one month.

At the beginning of the Aqueduct construction, the Board of Public Works estimated that a reasonable schedule would be eight feet per day for each end of the tunnel. They initiated a bonus of 40 cents per man for each foot more than the schedule. The bonus increased the workers daily wages by about 30 per cent but saved the City 10 to 15 percent overall as well as releasing equipment for use elsewhere. The average progress on the Elizabeth Tunnel climbed to 22.1 feet per day, or a little better than 11 feet for each end. The Board of Engineers had estimated it would take five years to finish the five mile tunnel. The men beat their deadline by 20 months.

Competition grew between tunneling crews in different parts of the world. The Elizabeth Tunnel hard rock crew had raced with the government men on the Gunnison Tunnel crew in Colorado and beat them. The Red Rock Tunnel crew raced with the Swiss drivers at the Loetchberg Tunnel for a rail line in the Bernaise Alps and won the world's record. In August 1909, the Swiss had beaten their own record by driving 1013 feet working with four air drills. The Red Rock crew beat that record



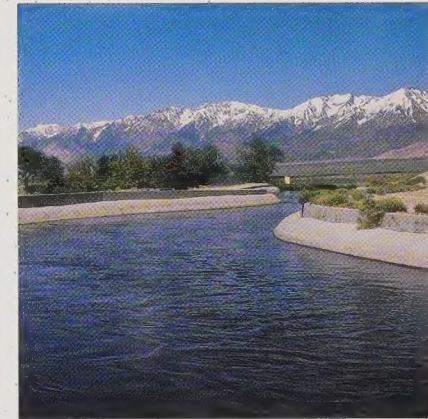


Steel pipe for siphon construction large enough to drive through.



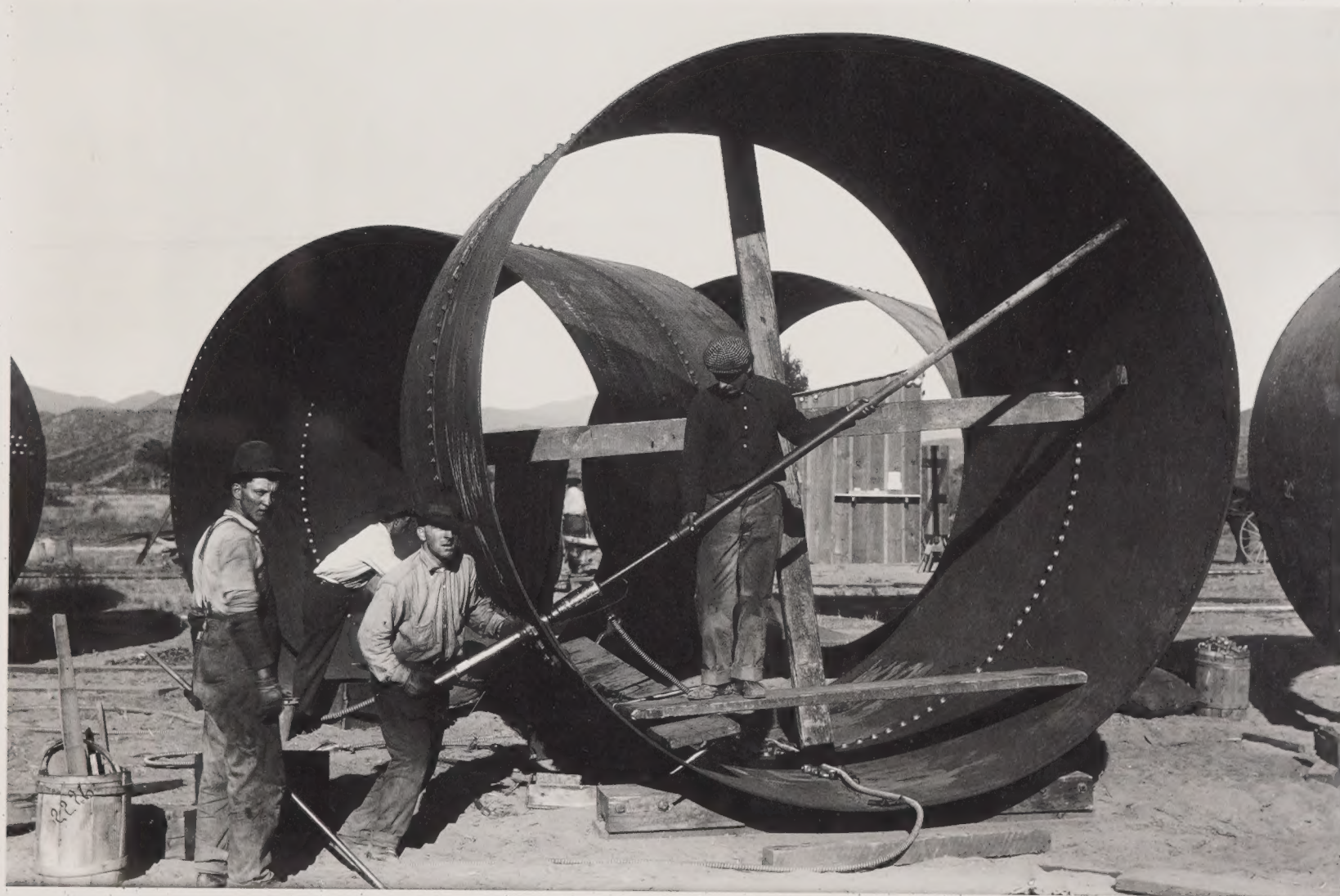
by driving through 1061 feet of soft sandstone using hand drills. More than six million pounds of blasting powder were used by the builders of the aqueduct. Concern for safety and use of the highest quality blasting supplies regardless of cost, kept underground fatalities to five men. Only highest quality German fuse was used, passing tests for timing and reliability which less expensive American fuse failed to meet.

When the 226 miles of aqueduct were completed, the work of the division engineers and construction superintendents was recognized throughout the world. The "Complete Report" states: "An engineering company, having trouble in driving a difficult tunnel in Spain, engaged at a large salary one of the men who broke the record in the Elizabeth tunnel...Another went to Argentina on a big public work, and the man who made the record drive in the Red Rock tunnel went to the Catskill Aqueduct. All over the world, the capable builders of the Los Angeles Aqueduct are doing big work and making good on their well-earned reputations for efficiency."



There are 37 miles of concrete lined channel in the Los Angeles Aqueduct.

Cover being placed over a lined section of the aqueduct. All 98 miles of the covered conduit was cast in place.



Steel pipe for siphon construction was often more than 1 inch thick and up to 10 feet in diameter.



The dedication ceremony at the Cascades, November 5, 1913, attracted 30,000 celebrants.

“THIS RUDE PLATFORM IS AN ALTAR.”

A carnival atmosphere prevailed for the dedication ceremonies at the “Cascades” on November 5, 1913. The San Fernando Valley Chamber of Commerce distributed bottles of Owens River water to the 30,000 celebrants who arrived by car, wagon, and buggy. The Southern Pacific charged \$1 for a round trip ticket from Los Angeles to the site of the San Fernando Reservoir near Newhall. Pennants proclaiming the event sold for 10 cents.

Mulholland rose to begin the ceremonies. He thanked his assistants and the City of Los Angeles for their loyal support. His address to the crowd was brief, “This rude platform is an altar, and on it we are here consecrating this water supply and dedicating this Aqueduct to you and your children and your children’s children -for all time.”

He paused for a moment as if contemplating his words. Then satisfied, he abruptly said, “That’s all,” and returned to his seat amid a tremendous roar from the crowd.

When the din subsided he was recalled to bring forth the water. The good natured but noisy crowd grew quiet as Mulholland unfurled the American flag from the speaker’s stand flagstaff. This was the signal to General Adna R. Chaffee, President of the Board of Public Works during the Aqueduct period, to perform the honored task of opening the gate valves.

At Chaffee’s command five men atop the concrete gate house put their weight to the great wheels that would lift the gates and release the water into the canal.

With the first trickle the crowd broke and ran to the canal. Hundreds of cups were dipped to the sparkling water. Horses reared in fright as the crowds cheered and horns blared. The

band played “Yankee Doodle Dandy”.

The program had called for Mulholland to formally turn the Aqueduct over to the Mayor, H.H. Rose, who would accept it on behalf of the people. However, all semblance of order had been lost. Mulholland turned to Rose, next to him on the platform, and shouted, “There it is Mr. Mayor. Take it.”

Mulholland had predicted that Los Angeles would have a population of almost 260,000 the day the aqueduct opened. But in 1913 Los Angeles had reached the dizzying figure of 485,000 residents. Within ten years Mulholland and others would be looking for water again.



Los Angeles Aqueduct Intake at Independence.

Men at the gatehouse open the gate valves to release the Owens River water.

“WHOEVER BRINGS THE WATER, BRINGS THE PEOPLE.”

By delivering the Owens River water to Los Angeles, Mulholland had made it possible for the city to prosper. The 1920s brought unprecedented growth and homes and businesses spread across the basin. There were several years of lower than normal snowfall in the Eastern Sierra. Local water use on privately owned land in the Owens Valley was increasing.

By the spring of 1923 both the City and the Owens Valley were facing water shortages.

The City lacked a dam and a storage reservoir to control the flow of the Owens River above the aqueduct intake at Independence. The best site, Long Valley, had remained in Fred Eaton's hands and Mulholland had rejected Eaton's asking price for the land.

Between Long Valley and the Independence intake, miles of irrigation canals diverted water to farms and ranches.

In order to increase supply, the City began pumping groundwater. Farmers in the Independence area filed injunctions in an attempt to halt falling water table levels. In Bishop and Lone Pine, residents became alarmed by the City's purchases of properties north of Independence for the acquisition of groundwater rights.

Wilfred and Mark Watterson were Inyo County's financial leaders. Owners of the Inyo County Bank, the Wattersons organized valley residents into a united opposition through the formation of an irrigation district.

The City of Los Angeles moved to acquire options on the McNally Ditch, the area's major canal, before its owners joined

the irrigation district.

A series of escalating confrontations ensued. Farmers illegally diverted water, leaving the canal empty. The City purchased land and water rights indiscriminately, leading to accusations of “checker boarding.” An environment of frustration and uncertainty prevailed. Area farmers felt vulnerable, unsure of the intentions of their neighbors.

The growing position of many valley residents was that Los Angeles should buy out the entire area.

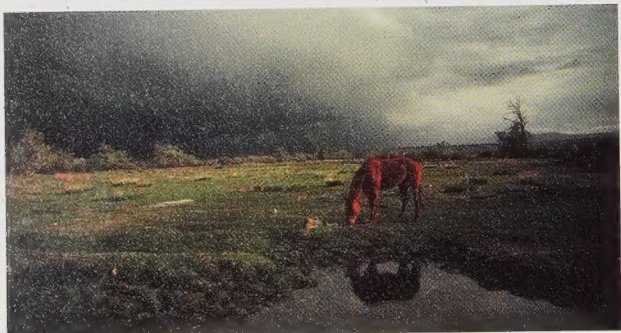
On May 21, 1924, the first violence of the dispute erupted. Forty men dynamited the Lone Pine aqueduct spillway gate. No arrests were made. Eventually, the two sides were entirely stalemated.

The City believed the wholesale purchase of the district unnecessary to meet its water needs. Instead, on October 14th, the City proposed a plan which would leave 30,000 acres in the Bishop area free of City purchases. The City also offered to help promote the construction of a state highway to the area, thereby creating a local tourist industry.

The Wattersons and the directors of the Owens Valley Irrigation District rejected the proposal, insisting on outright farm purchase and full compensation for all the townspeople.

On November 16, 1924 Mark Watterson led 60 to 100 people to occupy the Alabama Gates, closing the aqueduct by opening the emergency spillway. Renewed negotiation ended the occupation.

Finally, the conflict became completely centered on the issues of farm purchases and reparations to the townspeople. Attacks on the aqueduct began again in April, 1926 and by July, 1927 there had been 10 instances of dynamiting.



A horse grazes under a stormy sky near Bishop.

McNally Ponds.





The controversy was at its height when suddenly valley resistance was undermined. The Wattersons closed the doors of all branches of the Inyo County Bank. The Wattersons were not only bankrupt, later they were tried and convicted of thirty-six counts of embezzlement.

In the face of the collapse of both resistance and the Owens Valley economy, the City sponsored a series of repair and maintenance programs for aqueduct facilities which stimulated local employment. The City of Los Angeles also continued to purchase private land holdings and their water rights to meet the increasing demands.

Five important reservoirs were constructed from 1921 to 1929: Tinemaha on the Owens River, Upper San Fernando (Van Norman), Stone Canyon, Encino, and Hollywood. The water system of Los Angeles expanded by hundreds of miles of new mains and thousands of new service connections.

In 1928, William Mulholland left the DWP, shaken by the tragedy of the St. Francis Dam, 40 miles north of Los Angeles. On March 12th of that year, Mulholland inspected the dam, the construction of which he had supervised. Hours later it collapsed, killing 450 people in the ensuing flood. He accepted full responsibility and resigned.



Pumping plants move water along the Colorado River Aqueduct.

THE COLORADO RIVER: A REGIONAL SOLUTION

Mulholland turned east to the Colorado River as a new source of water. He began a four year series of surveys in 1923 to find an alignment which would bring the water of the Colorado River to Los Angeles.

In 1925 the Department of Water and Power (DWP) was established and the voters of Los Angeles approved a \$2 million bond issue to perform the engineering for the Colorado River Aqueduct. The DWP brought the cities of the region together with Los Angeles in 1928 to form a state special district. An act of the State Legislature created the Metropolitan Water District of Southern California (MWD). Its original purpose was to construct the Colorado River Aqueduct to supply supplemental water to Southern California. In 1931, voters approved a \$220 million bond issue for construction, and work began on the ten year project that would bring the water 300 miles to the coast.

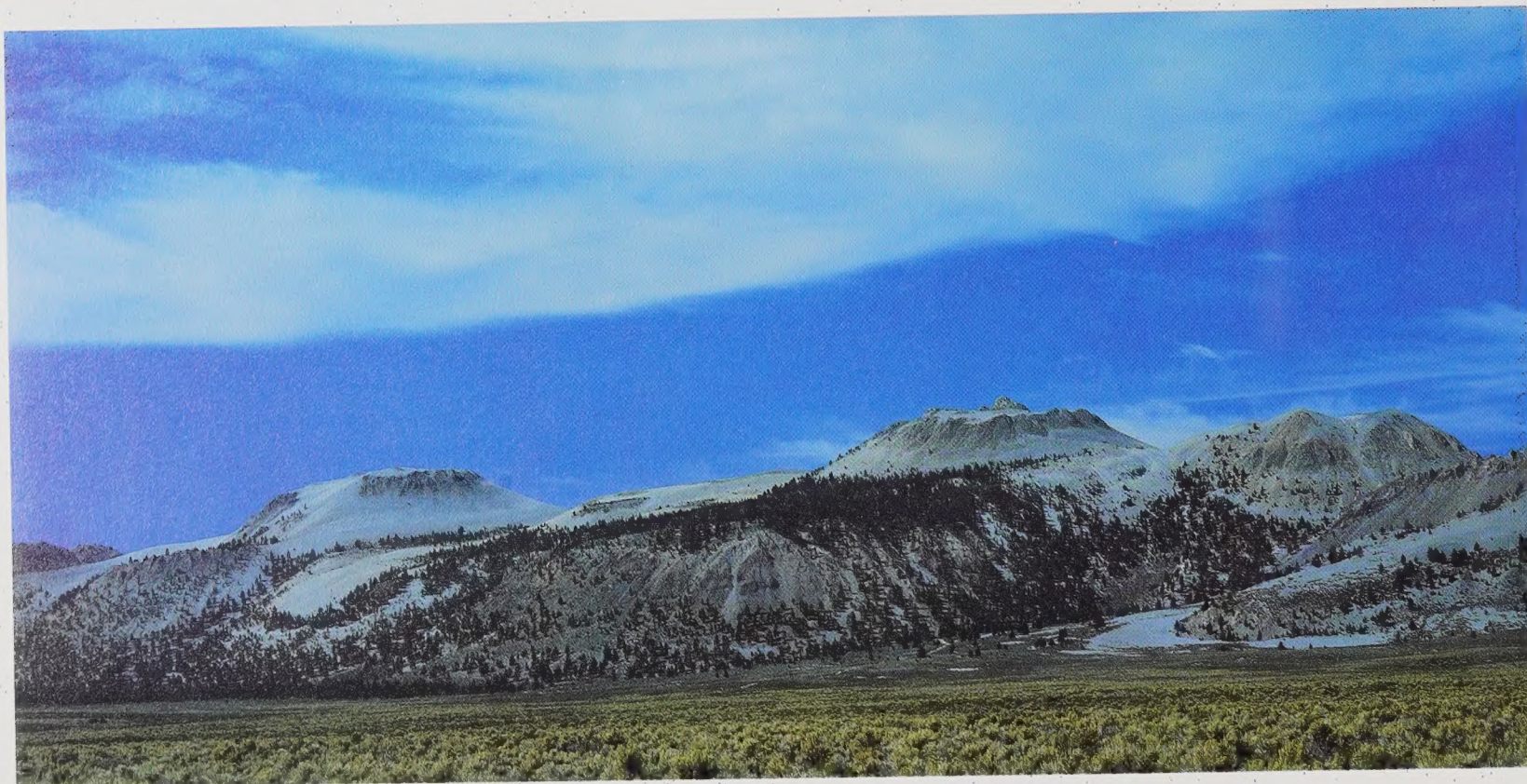
Part of the success of the project was the spectacular Boulder Canyon project, now known as Hoover Dam. The DWP, manager of its own hydroelectric power facilities along the Los Angeles Aqueduct, was instrumental in the struggle to gain federal approval for the project which combined flood control, water supply, and energy production for the three states that form the lower Colorado River basin.

Los Angeles, as primary consumer of the power, guaranteed its power purchases against the federal government's costs for the dam. Completed in 1935, the dam began furnishing power to the city the following year over a 226 mile transmission line built by the DWP.

Upon the completion of the Colorado River Aqueduct in 1941, MWD began to wholesale Colorado River water to its member agencies. Today those agencies include 14 cities, 12 municipal water districts, and a county water authority. More than 130 municipalities and many unincorporated areas are served by this product of the DWP's and Mulholland's vision.

Mulholland said, "Whoever brings the water brings the people." But as Los Angeles grew, it was the demand of the people that brought the water.

Before his death on July 22, 1935, Mulholland lived to see the beginnings of the Colorado River Aqueduct and Hoover Dam, constructed in the spirit of greatness he had always envisioned for Los Angeles.



An eleven mile tunnel was drilled through Mono Craters.



*Laying rail for the Mono Basin project,
extending the Aqueduct a further 105 miles.*

THE MONO BASIN PROJECT

As the country emerged from the Great Depression to enter World War II, Los Angeles voters continued to approve financing for water projects.

The Mono Basin Project was a construction program to obtain a larger and more dependable flow of water to the Los Angeles Aqueduct. The DWP planned to extend the Los Angeles Aqueduct 105 miles further north, 338 miles from Los Angeles, to take water diverted from the four creeks it had applied for permits for in 1923. By taking water from Parker, Walker, Lee Vining and Rush creeks, the City would obtain a high quality water supply for 500,000 people.

In 1935 the City applied to the Division of Water Resources to construct Grant Lake Dam to store water from the creeks. The application was referred to the State Fish and Game Commission for a determination of whether a fishway would be required for the dam. The Fish and Game Commission determined that no fishway would be required and construction of the dam was approved by the Department of Water Resources.

The City had also finally acquired the reservoir site at Long Valley. In the DWP's 1936 application to build a dam there, the same fishway issue was examined and this time a Fish and Game Commission hearing determined that an alternative method of providing fish culture would be provided to compensate for fish losses caused by the construction of both dams.

Following several investigations and studies, the City and the Fish and Game Commission executed the Hot Creek

Agreement in 1940. Under the agreement the City was to provide land, water rights, access roads, and construction funds for the construction of the Hot Creek Fish Hatchery, now probably the most productive fish hatchery in California.

An 11 mile tunnel was drilled through the volcanic Mono Craters to obtain water from Lee Vining, Parker, Walker, and Rush Creeks. It increased the capacity of the aqueduct system 35% to about 300 million gallons per day. The Long Valley Dam created Crowley Lake Reservoir, the largest reservoir in the Los Angeles Water system.

By the time the United States entered World War II, the Mono Basin Project was complete. Los Angeles swiftly became one of the country's most important war production centers. Its heavy manufacturing base continued to diversify, and the population grew with the war effort.

When the war ended, the stage was set for an economic boom with Los Angeles as prime beneficiary. By 1950, Los Angeles had a population of two million people and had become the fourth largest city in the United States. The DWP built the Owens River Gorge Hydroelectric Generating Station, the Valley Generating Station, and the Scattergood Generating Station to meet the growing demand for power.

The development of a series of hydroelectric power projects was a natural result of the engineering design of the Los Angeles Aqueduct. The aqueduct had been designed to deliver water to Los Angeles entirely by gravity, requiring no power for the pumping of water along the route. Using this natural gravity flow, engineers designed a series of penstocks



Mono Lake tufa is caused when fresh spring water chemically reacts with saline water causing calcium carbonate to precipitate.

which dropped the water to power plants located at the bottom of the Gorge. The force of the water was used to move turbines and create electricity.

During the 1960s there were certain years where the population of California grew as much as 1,500 persons a day. By the end of the decade one in ten persons in the U.S. lived in California. Los Angeles was the premier city in the country's most populous state.

Mono Craters construction camp.





The Mono Basin Project begins at the intake on Lee Vining Creek.

The Second Los Angeles Aqueduct enters the City at the Cascades, beside the first aqueduct.

A SECOND AQUEDUCT

The challenge of water supply continued to press. While the City had taken virtually its full Mono Basin entitlement for several years between 1941 and 1970, it found it could not divert the full amount authorized by the 1940s water rights permits on a long term basis without constructing additional conveyance facilities downstream from Mono Basin. The Water Rights Board and the Department of Water Resources urged the City to take steps to develop its full entitlement or risk the potential that other appropriations might be granted by the Water Rights Board.

At the same time, a U.S. Supreme Court decision in 1963 (Arizona vs. California) had allocated Arizona more water from the Colorado River, reducing MWD's entitlement to Colorado River water by more than 50%. In addition, water from the MWD was expensive because of the high energy costs involved in delivering it. This consideration, plus the availability of higher quality water, led to a decision to bring more Eastern Sierra water to Los Angeles.

The Second Los Angeles Aqueduct, an \$89 million dollar facility, was completed in 1970. Beginning at Haiwee Reservoir, just south of the Owens dry lake bed, this project was shorter and half as wide as Mulholland's "ditch," and was easier to build as a result of improved construction equipment and the lower cost of steel pipe. The new aqueduct added another 50% capacity to the water system. The two Los Angeles Aqueducts now deliver an average of 430 million gallons a day to the city.

Under normal circumstances, 70% of the city's water comes from the Eastern Sierra. Wells in the San Fernando

Valley and other local groundwater basins supply 15%, and purchases from MWD furnish the last 15%. From a system of ditches and waterwheels in the 1780s, the system has grown to 105 reservoirs, including four major reservoirs along the aqueduct system.



Alfalfa requires little use of pesticides, herbicides, or fertilizers. More than 2,000 acres of land are allotted for alfalfa farming in the Owens Valley.

A SHARED RESOURCE

Prior to 1970, water agencies in the Western United States had focused primarily on seeking supply. In June, 1965, Washington Senator Henry "Scoop" Jackson stopped the Columbia River diversion proposals by introducing legislation which prevented the Bureau of Reclamation from undertaking feasibility studies without prior approval from Congress.

This action together with the earlier Supreme Court decision in the case *Arizona vs. California*, gave signal to water agencies in the Southwest that they were rapidly approaching the supply limit. A changing climate of opinion had made the monumental diversion projects of the past unfeasible.

With supply nearly maximized, the DWP recognized that the next evolution in its role was to develop the resources it already had to their highest utility. For the City of Los Angeles, this meant developing a series of management programs to use the water as efficiently as possible and a stance of unceasing vigilance to protect the quality of the existing supply.

At the same time, environmental concerns were being viewed as increasingly important by the population in general. In 1970 the State enacted the California Environmental Quality Act (CEQA) to assist agencies and governments in examining the impacts of any given activity on the environment.

The 1970s in the Owens Valley were difficult for the City of Los Angeles. The completion of the second Los Angeles Aqueduct and the City's plan to augment the flow with groundwater from the Owens Valley prompted another wave of resistance in the valley.

This time the issue focused on groundwater extraction and

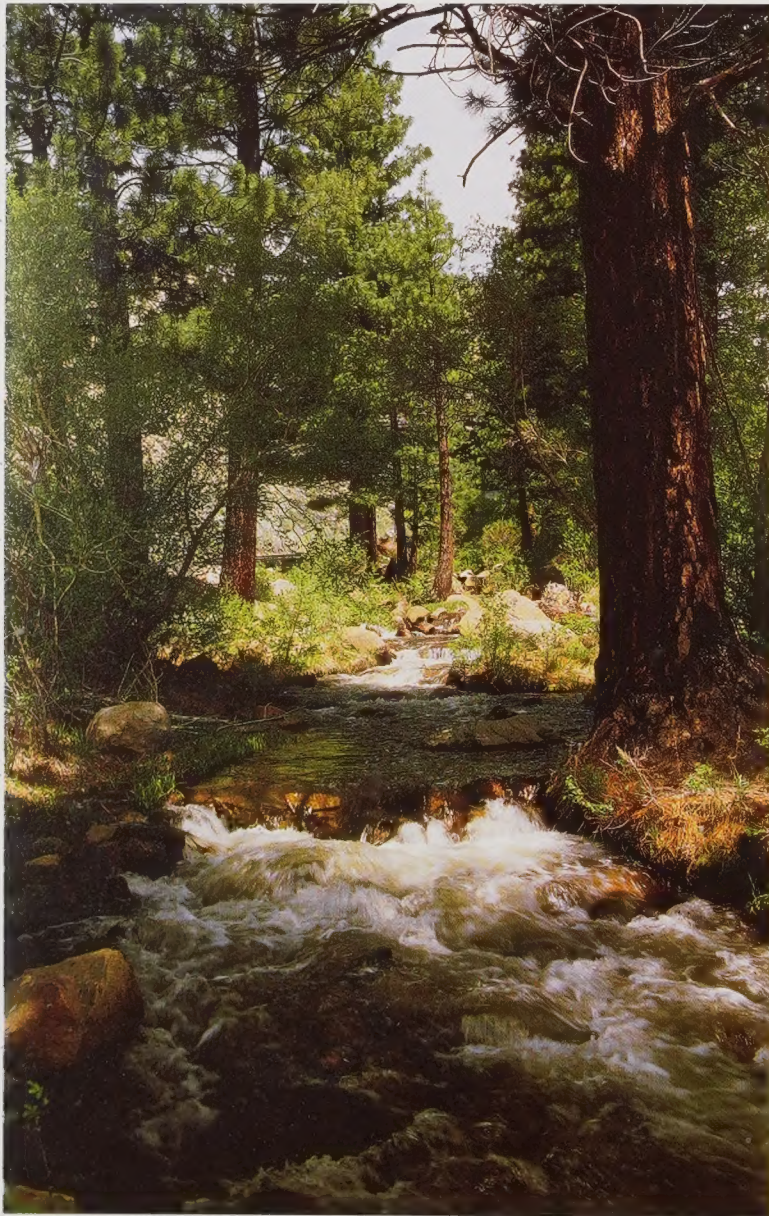
its impact on the valley environment. Inyo County, concerned about increased groundwater pumping to supplement the second aqueduct supply, sued the City of Los Angeles for an Environmental Impact Report under the new CEQA guidelines.

The report prepared by the City was rejected as inadequate by the court and again conflict escalated.

These and other issues were the cause of many court actions on both sides. This series of escalating controversies and legal actions led the City and the County to the conclusion that negotiation was preferable to continuing futile conflict. In September, 1982, Inyo County and the City of Los Angeles began the first stage of resolving their problems over this shared resource by signing a memorandum of understanding which provided for the formation of the Inyo/Los Angeles Standing Committee and a Technical Group. This agreement led to improved relations and cooperative efforts to resolve the disputes between the parties.

Following the formation of the committees, agreements were reached with the USGS to conduct cooperative Owens Valley groundwater and vegetation studies. By 1984, relations had improved to the point of both parties entering into an historic five year agreement. The agreement provided for setting aside litigation and jointly determining the groundwater pumping rate during the period the agreement was in effect. The agreement also called for joint development of a long term groundwater management plan for the Owens Valley. Additionally, the City agreed to implement numerous enhancement/mitigation projects.

The projects, which range in scope from the development of agricultural green belts to wildlife habitats and recreation,



Radio Telescopes placed in the area by Cal Tech are a compatible use of Owens Valley land.

The DWP with Inyo County has developed a number of enhancement and mitigation programs in the Owens Valley.



are primarily aimed at beautifying the Owens Valley and mitigating any adverse effects that may be attributed to groundwater pumping.

In early 1988, the parties agreed to extend the agreement to allow additional time to complete the joint studies and to develop a long term management plan.

In the Owens River-Mono Basin, land management by the Department of Water and Power permits recreational, farming, and ranching activities. Today, 80% of the 312,000 acres owned by the DWP in the region is leased. The City's long standing land use policy requires that 75% of these leased lands remain open to the public for recreational use. This policy, along with federal management of public lands in the surrounding mountains, has preserved the natural setting of the region.

Over 240,000 acres of land are leased to ranchers for cattle grazing, and of 18,000 irrigated acres, 2000 are allocated for alfalfa production which requires little use of fertilizers, herbicides, or pesticides.

Grazing and recreation are compatible with watershed protection and are an important part of a land management program which provides viable business opportunities while satisfying the goal of water quality protection.

In addition, the DWP and the California Department of Fish and Game have developed a multitude of fish and wildlife programs on City-owned lands. Since 1975, the DWP has employed a wildlife management staff including wildlife biologists and vegetation specialists. As well as a vegetation mapping program, the staff is engaged in ongoing monitoring, including rare plant studies.

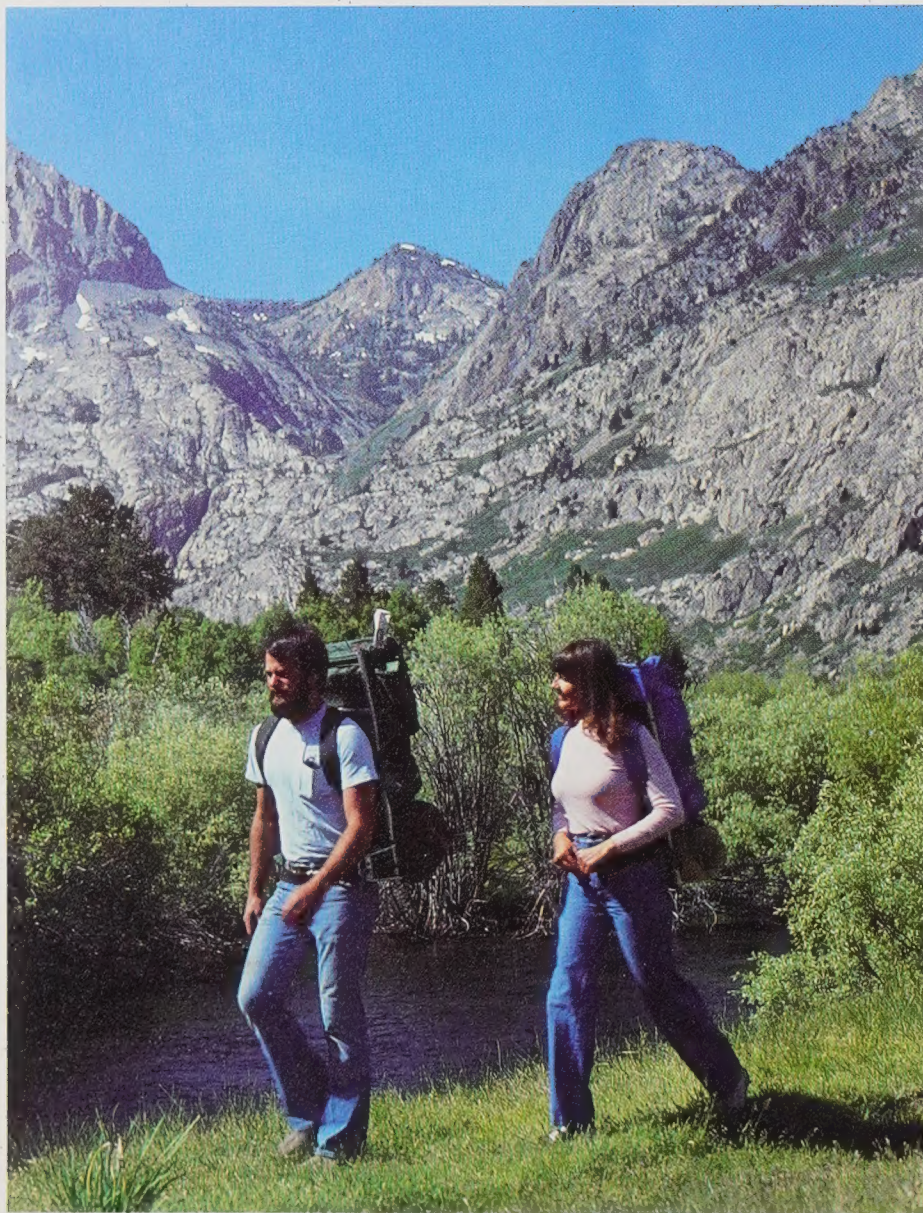
Wildlife and waterfowl habitat projects include habitat protection and enhancement for the endangered Owens Pupfish, the American Osprey, the Tule Elk, the Peregrine Falcon, and migrating and nesting waterfowl.

As a member of the Interagency Committee on Owens Valley Land and Wildlife, the City has participated in cooperative projects which include the Visitor's Center in Lone Pine, the Bishop woodlot, experimental vegetation planting programs, a native plant nursery, the Tule Elk viewpoint near Tinemaha Reservoir, the Sage Grouse viewpoint north of Crowley Lake, and warm water fisheries and waterfowl habitats at Lone Pine and Buckley Ponds.

The DWP also leases approximately 3,000 acres to government agencies for campgrounds, airports, and scientific projects such as the Cal Tech Radio Telescope and the University of California White Mountain Research Lab. Approximately 2,000 acres of City property is leased for industrial uses where there is no water pollution problem and where industry will not detract from the scenic beauty of the area.

These land management policies have helped to develop the potential of the Owens Valley and the Mono Basin for recreation as well as agriculture. In addition, DWP reservoirs at Grant and Crowley lakes have come to afford the residents of California some superb recreational opportunities. Millions of trout are grown in fish hatcheries for release into local streams, and on opening day more than 17,000 anglers start their fishing season on Crowley Lake.

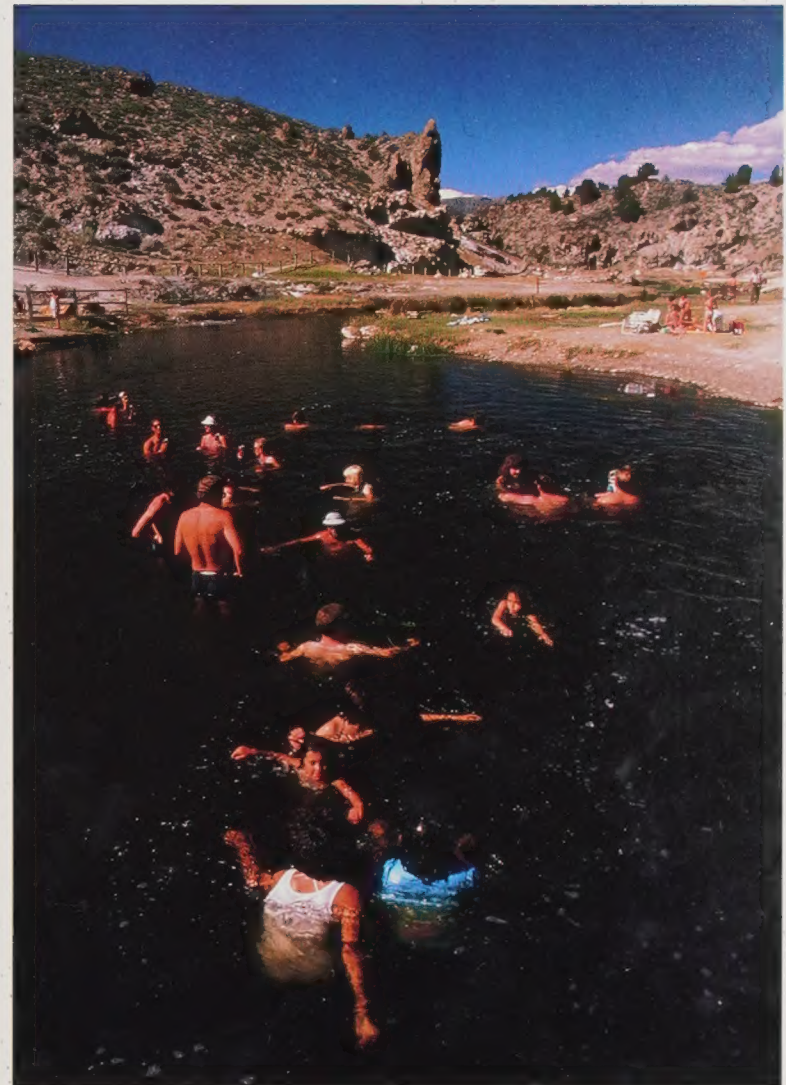
Recreation is now a major part of the region's economy. Abundant snowfall offers skiers a seven month season at



Tule Elk habitat enhancement is part of a DWP and State Department of Fish and Game joint program.

Hiking along Rush Creek is part of an effort to encourage water quality compatible uses of Mono Basin land.

Mammoth Mountain. Swimmers enjoy the geothermally heated water at Hot Creek and the area's many lakes and streams provide unparalleled myriad opportunities for boating, water-skiing, camping, and fishing.

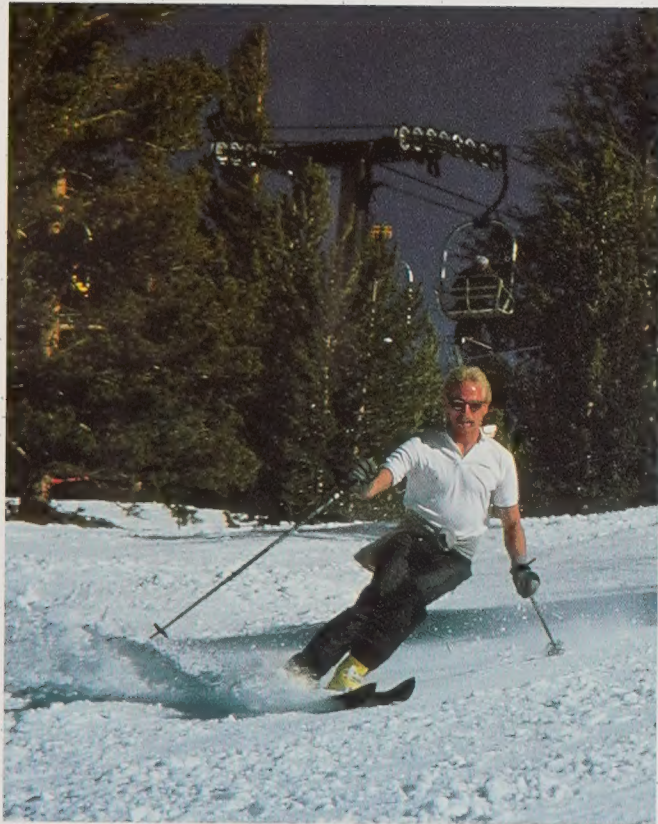


Swimmers enjoy the geothermally heated waters of Hot Creek.

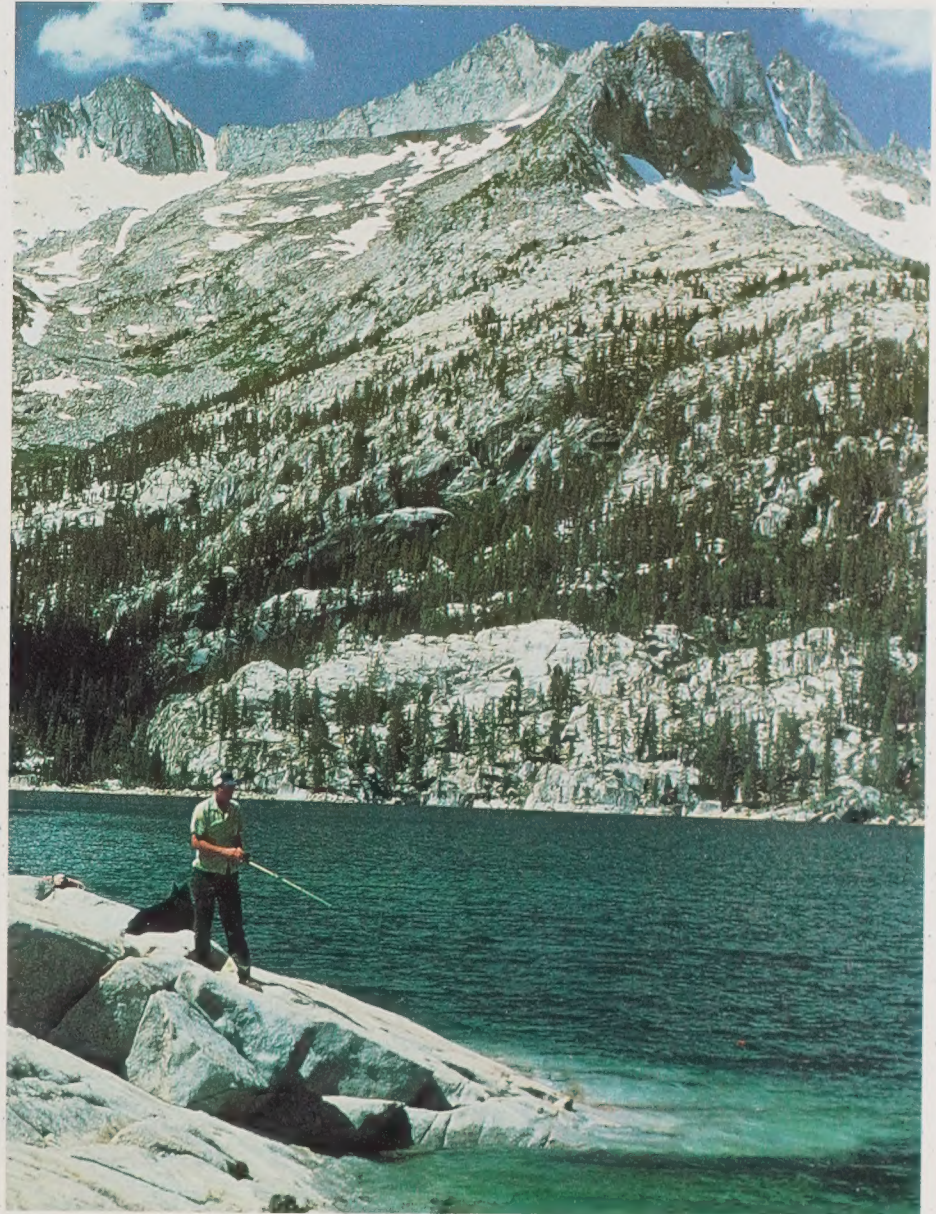


Over 240,000 acres of the Owens Valley is leased to ranchers for grazing.

Opening day of the fishing season attracts more than 17,000 anglers.



Mammoth Mountain offers skiers a seven month season.



The beauty of the Eastern Sierra attracts visitors looking for a contrast to urban life.



The Los Angeles Filtration Plant was constructed in 1986.

WATER QUALITY

The growth of Los Angeles had always forced the City to be concerned with the adequacy of its supply, and consequently its attention had always been directed outward in its search. The new emphasis on managing the water resource brought protection of water quality to the forefront as the primary goal of good management.

Today, Los Angeles is the second largest city in the nation. In 1987, Los Angeles received a rating of "excellent" for the quality and taste of its water from a leading consumer publication. This is a result of high quality source waters, diligent monitoring, and state of the art water treatment.

There are three sources for Los Angeles' water: 70% comes from the Owens Valley and Mono Basin via the Los Angeles Aqueduct System, 15% from the San Fernando groundwater basin, and 15% from the Metropolitan Water District's Colorado and Feather River supplies.

Water from the Mono Basin and Owens River watersheds is protected from industrial and agricultural contamination by DWP land management practices. However, some turbidity arises as water from the watersheds travels through unlined channels in a natural rural setting before being diverted into the two aqueducts for its journey to the City.

The DWP determined that a filtration plant would be necessary to reduce this turbidity and in 1986 Los Angeles completed its first filtration plant. Using ozone and rapid rate deep bed filters, the \$146 million Los Angeles Filtration Plant treats up to 600 million gallons of water each day. It is the largest direct filtration plant in the U.S. and the second largest ozone plant in the world.

One benefit resulting from the use of ozonation as a disinfectant process is the reduction in formation of trihalomethanes (THMs). These chemical compounds are formed when chlorine combines with naturally occurring organic material in the water. By using ozone as a disinfectant in the initial treatment process, instead of chlorine, the City is able to reduce THMs by as much as 50%.

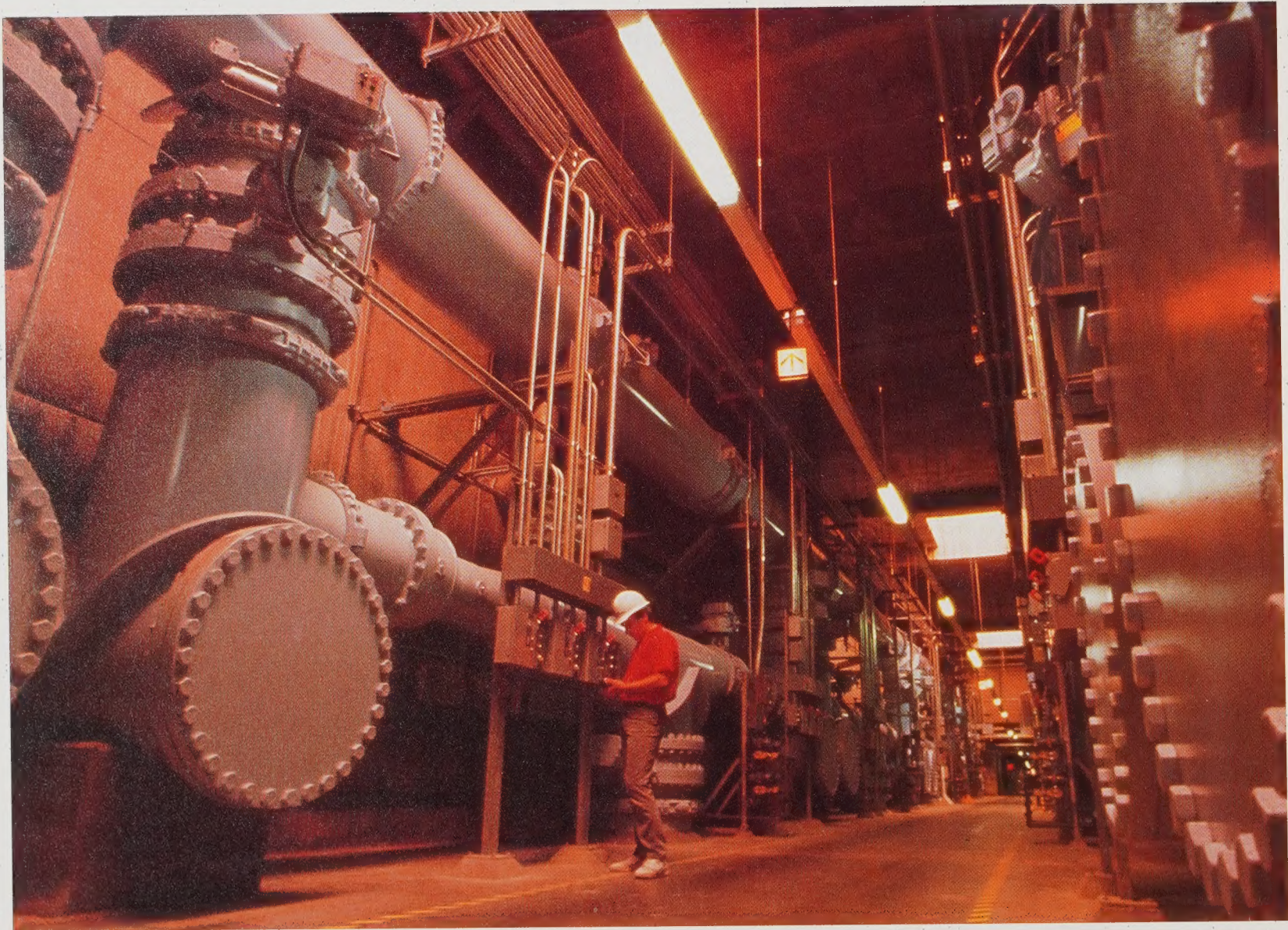
The next 15% of the City's water comes from MWD. As Arizona begins to exercise its increased rights on the Colorado River, the MWD will need to rely more on northern California water supplied through the State Water Project. When water from the State Water Project flows through the Sacramento-San Joaquin Delta it picks up organic material from the riverbeds.

With increased use of water containing a greater amount of organic material, higher levels of THMs in the MWD supply would have been likely. However, by using chloramines, a combination of chlorine and ammonia, as a primary disinfectant, the MWD has taken steps to reduce this problem.

The San Fernando groundwater basin not only supplies 15% of Los Angeles' domestic needs, but it also acts as a vast underground reservoir where water accumulates during years of abundant rainfall and is stored for use in the future.

In 1980, newly available sensitive monitoring equipment detected trace amounts of trichloroethylene (TCE) and perchloroethylene (PCE), as well as smaller amounts of other industrial chemicals in the San Fernando groundwater supply.

The concentration of these contaminants is very small, measured in parts per billion (a part per billion is equivalent to a few drops in a swimming pool). There is concern, however,



Large pipes route the water to the filter beds at the Los Angeles Filtration Plant.

that a lifetime of exposure to even very low levels of these contaminants could have a negative health effect. Both the State and federal government have, therefore, established very demanding standards for the amount of these contaminants that are allowed in a water supply.

The City's groundwater supply meets all of these standards at all times.

The contamination which exists has been temporarily dealt with by shutting down the more highly contaminated wells and blending well water with Los Angeles Aqueduct water to dilute any contamination that might be present.

The San Fernando Groundwater Management Plan, the result of a study funded by the Environmental Protection Agency, recommended clean up procedures and ways to protect the basin from further contamination. Among the recommendations were the installation of separate sewers for industrial areas in the San Fernando Valley, a collector program for small hazardous waste generators, and a city ordinance requiring testing of underground tanks.

The removal of existing TCE and PCE from the basin is beginning with the development of the North Hollywood Aeration Tower where groundwater is aerated causing the contaminants to evaporate out of the water and into an air stream. This air stream is filtered through activated carbon to be sure none of the contaminants are released to the atmosphere.

The DWP is sponsoring research aimed at developing new technologies that will assist in the removal and destruction of groundwater contaminants. One such technology, known as



Back washing cleans the filters at the Los Angeles Filtration Plant and keeps them running efficiently.



The Metropolitan Water District supplies 15% of Los Angeles' water. Water from the Sacramento-San Joaquin Delta is imported via the California Aqueduct.

advanced oxidation, uses ozone and hydrogen peroxide to oxidize groundwater contaminants into harmless by-products such as chloride and carbon dioxide. The Department of Water and Power continually monitors the purity and quality of its water supply. More than 60,000 laboratory and field analyses are made yearly, 15,000 for bacteriological control and the balance for chemical, physical, and radiological inspections. Sampling occurs at all sources: watershed, reservoirs, distribution mains, and consumer taps. Water carrying and storage facilities are also checked.

The people of Los Angeles today enjoy safe drinking water from high quality sources which meets or exceeds all standards set by state and federal agencies. The Los Angeles Department of Water and Power is constantly working to assure that this continues into the future.



The Owens River and Mono Basin supply 70% of the City's water.



Water conservation education programs promote water conservation.

Water conservation education is a significant part of the DWP's program to reinforce conservation ethics among citizens.

WATER CONSERVATION

Another part of the water resources management program was the development of new and stronger conservation measures. The program of water metering initiated by Mulholland had, by 1985, resulted in a per capita daily use of 178 gallons overall and 111 gallons for domestic use. This rate of use, though only 50% to 60% of that of unmetered cities such as Sacramento, was not enough.

During the 1977-78 statewide drought, the City renewed its efforts to strengthen its water conservation program. What resulted was one of the most aggressive and comprehensive on-going water conservation programs in California.

Under this program, the City developed public information and school education programs to promote the reinforcement of conservation ethics among its citizens. Through distribution of conservation kits and audits for all types of residence, business, and landscapes uses, Los Angeles has helped to focus public attention on water conservation. Consumers are aided in monitoring their consumption through billing programs which compare use from year to year.

To further encourage conservation, the City has seasonal water rates which are approximately 20% greater during the summer higher use period. And to reinforce the conservation message, the Department sponsors an annual Water Conservation Gardens contest which rewards residents who use drought tolerant plants which require less water to create beautiful gardens.

At the domestic level, the Department enables City residents to further conserve water by providing them with

several water conservation devices. The DWP provides, upon request, free water conservation kits which include low flow shower heads, water displacement bags for toilet tanks, and dye tablets which help to detect toilet tank leaks to residential customers.

The City has also undertaken its own conservation measures, including a program to replace water mains nearing the end of their useful life. This comprehensive replacement program helps to reduce losses through the DWP's domestic distribution system.

In addition, the City of Los Angeles has recognized the need to be able to respond to the water needs of its citizens in an emergency. In 1977, a Blue Ribbon Water Conservation Committee, appointed by the Mayor, recommended the adoption of the Emergency Water Conservation Ordinance. By adopting this ordinance, the City Council has empowered the mayor to impose mandatory water conservation measures in droughts and other emergencies. Thus Los Angeles is both prepared to meet emergencies and accepts the responsibility to conserve and protect this vital resource.



The City irrigates this golf course with recycled water.



The Los Angeles Glendale Water Reclamation Plant supplies 20 million gallons per day of reclaimed water for industrial and irrigation uses.

WATER RECLAMATION

An important part of the City's expanding emphasis on water conservation is the concept that water is a resource which can be used more than once. Because all uses of water do not require the same quality of supply, the City has been developing programs to use reclaimed water for suitable landscaping and industrial uses.

Water reclamation programs currently meet some of the City's landscaping supply needs. Reclaimed water from the 20 million gallon per day Los Angeles Glendale Water Reclamation Plant is used to irrigate two golf courses in Los Angeles' Griffith Park, supply cooling water to a Glendale power plant, and irrigate landscaping along the Golden State Freeway.

Use of reclaimed water at the park and for freeway landscaping will be expanded in the future and the DWP has plans to use the Glendale facility to supply more than 400 million gallons per year to four large irrigation customers nearby.

A second 40 million gallon per day facility, the Donald C. Tillman Water Reclamation Plant, will supply irrigation water to golf courses and parks in the Sepulveda Dam Recreation Area.

Plans are under way to further develop water reclamation for Los Angeles. Its use, however, is limited by state health requirements and the high cost of pumping plants and distribution facilities to deliver water from the reclamation plants to the customers.

Even though Los Angeles is located in a semi-arid region, its water supply often has been taken for granted. Periodic droughts, resulting measures and ongoing DWP programs

serve to remind us that the responsibility to conserve water belongs to all of us.

The 40 million gallon per day Donald C. Tillman Water Reclamation Plant will supply reclaimed water for irrigation in the Sepulveda Dam Recreation Area.





Today at 3.4 million people, Los Angeles is the nation's second largest city.

SHARING THE VISION

Near the end of his life Mulholland wrote: "Los Angeles was a place after my own heart...The people were hospitable... The country had the same attraction for me that it had for the Indians who originally chose this spot as their place to live... It was so attractive to me that it at once became something about which my whole scheme of life was woven. I loved it so much."

In the years since Mulholland realized his dream of the Los Angeles Aqueduct, millions have come to Los Angeles. They have shared his vision of the City as an ideal home. But the water has made it possible for them to stay, to flourish, and to continue to dream of the greatness of the future.

Even though the city's growth rate has finally slowed, its water and power needs are more critical and complex than ever before. Today the people of the Department of Water and Power continue to serve the City in Mulholland's tradition, meeting the challenges and always searching for the best solutions to the problems of supply, demand, and quality.



AQUEDUCT SYSTEMS IN CALIFORNIA



RETURN TO: _____

LOAN PERIOD	1	2	3
Home Use			
	4	5	6

ALL BOOKS MAY BE RECALLED AFTER 7 DAYS.

DUE AS STAMPED BELOW.

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U. C. BERKELEY

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UNIVERSITY OF CALIFORNIA, BERKELEY
Berkeley, California 94720-6000



FIRST LOS ANGELES AQUEDUCT FACTS

Year Completed	1913
Construction Duration	5 years
Length of Aqueduct (in miles)	
Unlined Channel	24
Lined Channel	37
Concrete Conduit	98
Steel and Concrete Pipeline	12
Tunnels	<u>52</u>
Total	223 miles
Aqueduct Capacity	485 cfs
Construction Cost	Less than \$23,000,000

SECOND LOS ANGELES AQUEDUCT FACTS

Year Completed	1970
Construction Duration	5 years
Length of Aqueduct (in miles)	
Concrete Conduit	64
Steel Pipeline	69
Other Facilities	<u>4</u>
Total	137 miles
Aqueduct Capacity	290 cfs
Construction Cost	\$89,200,000



Design:
Geographics

Cover photograph:
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